CRADA signing

By Jim Danneskiold
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Aircraft half the weight of today's planes, cars so strong they survive the worst crashes and even elevators that may whisk passengers into outer space are among the goals of a major research partnership announced last Friday between the Laboratory and a Dallas company.

Based on an invention by Yuntian Zhu of the Superconductivity Technology Center (MST-STC), the partnership will develop ultra-strong fibers made of carbon nanotubes for a vast range of applications. Carbon Designs Inc., headed by former Laboratory staff member Brad Edwards and Dallas investor Brent Waller, initially will pump $2 million into work by Zhu's team, and hopes to bring novel, super-strong materials to market by late 2006.

"It's the seminal ideas that come out of small teams here at the Laboratory that lead to these successes," said Acting Deputy Director Don Cobb at a signing ceremony in the Materials Science Laboratory Auditorium at Technical Area 3. The Cooperative Research and Development Agreement is one of the largest sponsored research agreements ever signed by the Laboratory. CDI also received an exclusive license for the Laboratory's intellectual property and may obtain additional rights to patents that result from the collaboration.

The project's goals include developing new methods for synthesizing carbon nanotubes and new technologies for producing ultra-strong fibers from the carbon nanotubes.

"We're talking about something that is revolutionary," said Edwards.

Edwards, a former staff member in what is now the International, Space and Response (ISR) Division, has gained a global reputation for his breakthrough work with NASA developing the space elevator theory, winning multiple patents for that research and authoring a recent book, "The Space Elevator."

Acting Deputy Laboratory Director Don Cobb greets Carbon Designs Inc. founder and former Lab technical staff member Brad Edwards during a signing ceremony last Friday in the Materials Science Laboratory Auditorium at Technical Area 3. The Lab and Carbon Designs Inc. signed a cooperative research and development agreement to collaborate on the development of ultra-strong fibers made of carbon nanotubes that are expected to be many time stronger than any current engineering materials. Carbon Designs Inc., plans to initially invest $2 million in the joint effort. At right in photo is Yuntian Theodore Zhu of the Superconductivity Technology Center (MST-STC), while behind Edwards is Brent Walker of CDI. enlarge image

Yuntian Theodore Zhu and Dean Peterson of Los Alamos' Superconductivity Technology Center (MST-STC) listen to comments at last Friday's cooperative research and development agreement signing in the MSL Auditorium. enlarge image

Credit: LeRoy N. Sanchez, Public Affairs

Although their diameter is roughly one-ten-thousandth that of a human hair, carbon nanotubes are 100 times stronger than steel, more durable than diamonds and provide the highest thermal conductivity of any material. They are cylindrical carbon molecules similar in structure to fullerenes, or buckyballs; however, nanotubes are tubular, not spherical.

The challenge that has faced researchers since the discovery of carbon nanotubes by Japanese scientist Sumio Iijima in 1991 is handling such gossamer materials and spinning them into useful lengths.

Zhu and his team recently made a four-centimeter-long carbon nanotube, the longest ever. The emphasis in Zhu's research on the manufacture of stronger carbon nanotube materials is the chief reason CDI decided to form a partnership with the Laboratory, Waller said.

"What we like and what is going to give us an edge is making super-strength materials," Waller said.

Among potential applications that have attracted wide interest in carbon nanotubes are military body armor, power transmission lines, suspension bridges and artificial muscles. Their catalytic and adsorptive properties could lead to a multitude of uses in biology and environmental cleanup, said Dean Peterson, who heads the Laboratory's STC. In addition to their potential value in microelectromechanical systems, they could spawn a new generation of fuel cells.

Peterson called the material the building block of the nanotechnology revolution.

"Almost any technology you can think of could be impacted by carbon nanotubes," Peterson said. "They will result in the most incredible devices that you'll never see."

Members of the team that will be developing carbon nanotube production methods at Los Alamos include Zhu, Lianxi Zhang and Qingwen Li, all of MST-STC, and Jose I. Archuleta of Structure/Property Relations (MST-8). Outside partners planning to work with the Los Alamos team include Sandia National Laboratories and the University of Kentucky.

CDI is a recently formed corporation with the primary goal of becoming the research and development source for the strongest material ever produced, with a focus on carbon nanotube-based materials to achieve tensile strength many times that of steel, polymers or carbon composites.

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CRADA signing

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Previous Issue